Basewide Energy Systems Plan for Fort Bragg, North Carolina

Final Report

Executive Summary

Facilities Engineer

Conservation Measures

Prepared for:

Savannah District,

Corps of Engineers

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October 1984

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BASEWIDE ENERGY SYSTEMS PLAN
FOR
FORT BRAGG, NORTH CAROLINA

FINAL REPORT
EXECUTIVE SUMMARY
INCREMENTS A, B, C, D, E, F, AND G
AND HOSPITAL ENERGY AUDIT

Prepared for:

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Army Contract No. DACA21-80-C-0014
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October 1984

EXECUTIVE SUMMARY

1. INTRODUCTION

This report presents the results of Increments A, B, C, D, E, F, and G of the Energy Engineering Analysis Program, as well as the energy audit of Womack Hospital, conducted at Fort Bragg in Fayetteville, North Carolina, by JRB Associates under Contract No. DACA21-80-C-0014. This report includes analyses of the energy patterns at the facility, and the identification and evaluation of energy conservation opportunities. The results obtained indicate that energy use at Fort Bragg will remain constant through FY 1985, compared to FY 1975 energy use. This will be achieved even though the total square feet of conditioned space is projected to increase by 14 percent. This report is organized into eight volumes, plus appendices.

2. EXISTING ENERGY USE

Fuel oil, natural gas, and electricity are the main energy sources at Fort Bragg. In FY 1975 the total energy use at the Post was 5,295,000 MBtu. A summary of the FY 1983 basewide energy use by fuel type is given in Table 1, which shows that electricity accounts for approximately 52 percent of the total energy use. Energy use by fuel type for the years 1977 to 1979, 1982, and 1983 is shown in Table 2.

Early work in this study emphasized energy uses in buildings and production efficiencies of major utility plants and distribution systems.

Initial data for the study were gathered through a series of site visits during which buildings were inventoried, patterns of building energy use were identified, and typical buildings were selected for detailed study in each category. These energy-use data were analyzed to determine how much energy the various types of buildings used and the functional energy use. Since this effort initially took place in 1980, FY 1979 energy use data was the basis of the analysis. Figures 1, 2, 3, and 4 provide a summary of the building inventory and energy use in FY 1979. The energy profiles in these figures were developed by evaluating the energy use of typical buildings and expanding those values to represent the entire Post.

TABLE 1. ENERGY USE AT FORT BRAGG - FY 1983

ENERGY SOURCE	ANNUAL ENERGY USE		ANNUAL ENERGY COST
	INDIVIDUAL UNITS	SOURCE USE MBTU	
Electricity	247,120,000 kWh	2,866,611	$11,249,208
Natural Gas	13,492,290 therms	1,349,279	$ 7,031,768
Propane	562,410 gals	53,429	$ 337,446
#2 Fuel Oil	6,436,604 gals	892,757	$ 6,629,702
#6 Fuel Oil	1,014,621 gals	152,193	$ 685,072
TOTAL		5,314,263	$25,933,196

TABLE 2. ANNUAL ENERGY USE FY 1977-1983
($Btu \times 10^9$)

ENERGY SOURCE	FY 1977	FY 1978	FY 1979	FY 1982	FY 1983
Electricity	2,501.3	2,654.3	2,608.0	2,775.0	2,866.6
Natural Gas	274.9	310.6	578.0	1,255.0	1,349.3
Propane	87.7	67.0	50.3	54.8	53.4
#2 Fuel Oil	1,071.8	1,128.3	919.1	1,089.3	892.8
#6 Fuel Oil	1,221.3	1,228.4	875.5	192.2	152.2
TOTAL	5,157.0	5,388.6	5,030.9	5,367.3	5,314.3

SOURCE: Data derived from information provided by Facilities Engineer, Fort Bragg, N.C. FY 1975 energy use was 5,294.9 x 10^9 Btu.

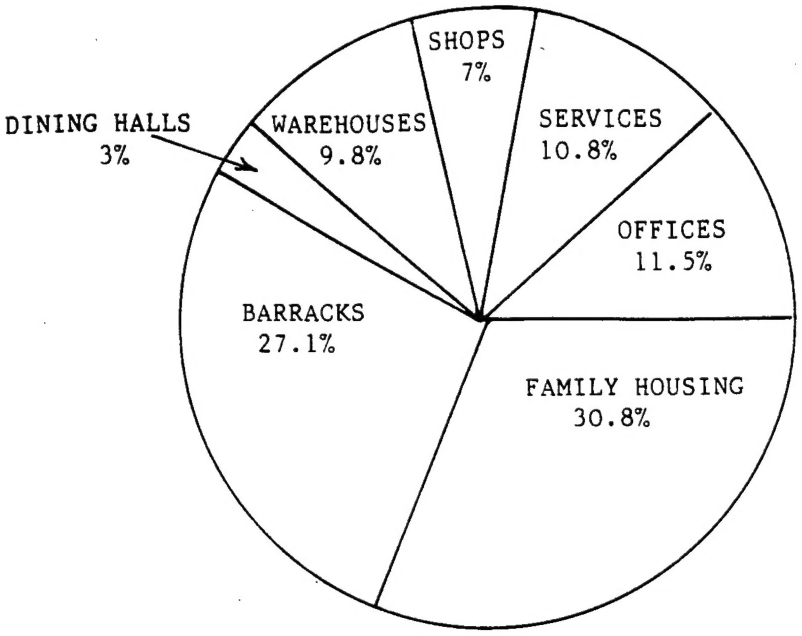

FIGURE 1. FLOOR AREA PROFILE BY BUILDING CATEGORY

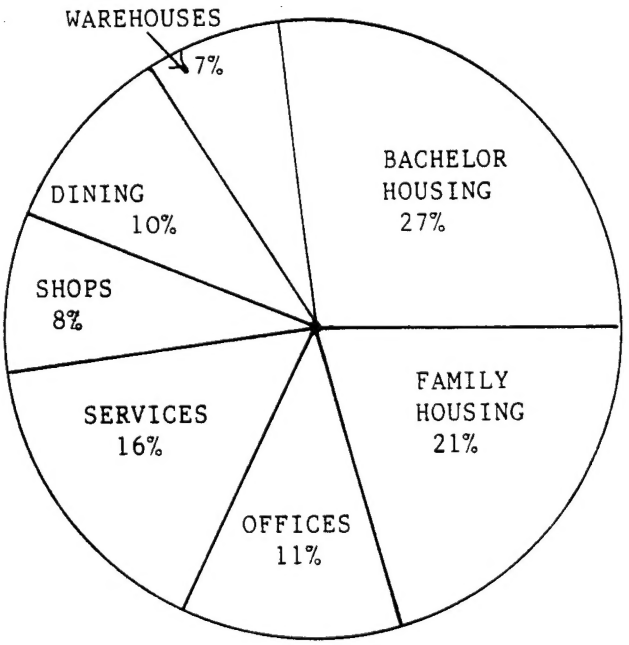

FIGURE 2. ENERGY USE BY BUILDING CATEGORY

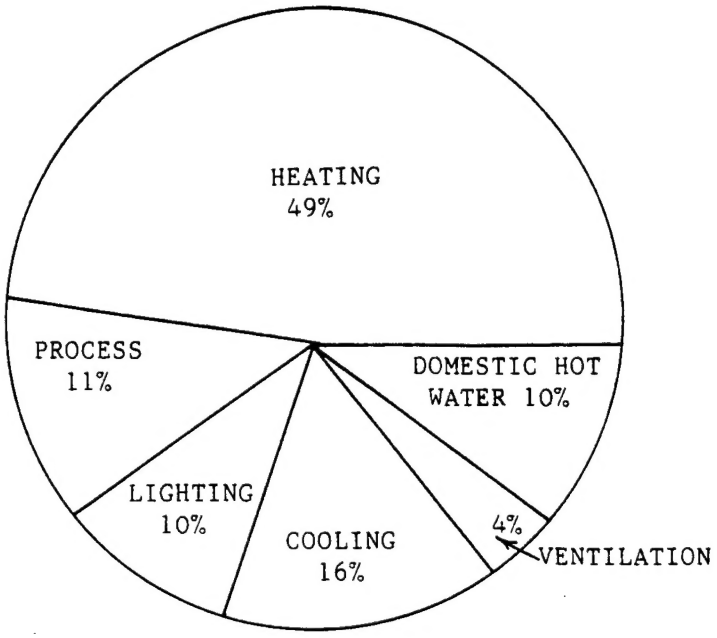

FIGURE 3. ENERGY USE BY BUILDING CATEGORY

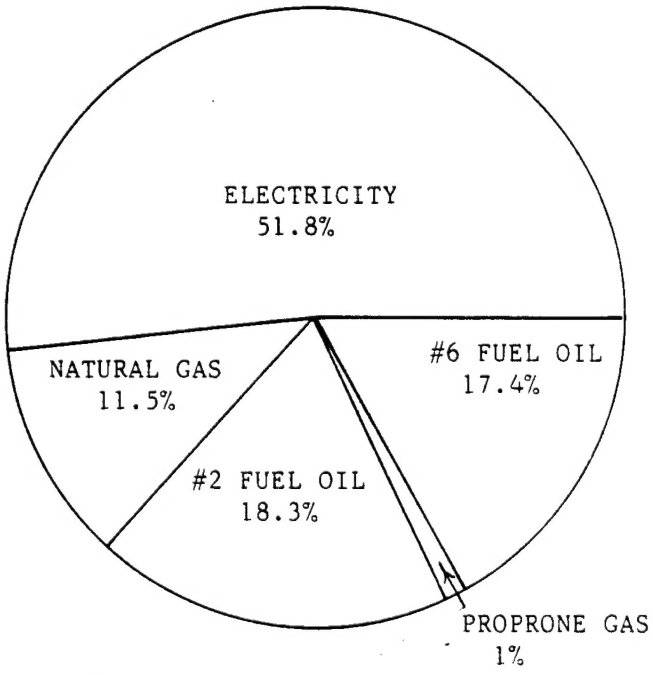

FIGURE 4. FY 1979 ACTUAL ENERGY USE

3. ENERGY CONSERVATION MEASURES DEVELOPED

The energy conservation opportunities at Fort Bragg are summarized in Table 3. This table shows all projects evaluated and the resulting economic indices. These energy conservation opportunities were developed by analyzing their applicability to typical buildings. Those that met ECIP criteria were developed into projects with appropriate documentation (DD Form 1391's and PDB's). Table 4 provides a listing of the recommended ECIP projects. All recommended energy conservation projects identified by JRB are listed in Table 5.

Recommended policy changes for Fort Bragg to improve energy management include:

- Use contracted maintenance work to reduce energy use by inspecting and repairing bad steam traps, HVAC controls, and condensate return pumps;
- Increase the training budget and allow junior, as well as senior, employees to attend training courses.

4. ENERGY AND COST SAVINGS

The total energy savings potential of the recommended energy conservation projects is 1,039,000 MBtu per year. This represents an estimated energy cost savings of approximately $2.5 million dollars using FY 1985 projected energy costs. The impact on Fort Bragg's total energy use represented by these projects is shown in Table 6.

5. RESULTS OF INCREMENT A - BUILDINGS

The scope of Increment A included an engineering analysis of all existing buildings at Fort Bragg. For each type of building, specific characteristics having a significant effect on energy were identified. Table 7 shows these characteristics. The energy use of these buildings is identified in Table 8. Based upon these analyses energy conservation projects were evaluated using ECIP criteria to determine acceptability. The recommended ECIP projects developed under Increment A are identified in Table 4.

TABLE 3. EVALUATED ENERGY CONSERVATION OPPORTUNITIES

ECO	E/C	SIR OR B/C*	ENERGY SAVINGS MBTU/YR	COST($)
Central Heating/Cooling Plants				
Heating Plant Modifications	63.05	10.04	77,948	1,236,410
Refuse Incinerator	30.38	6.82*	293,139	9,649,910
Return Condensate	--	5.6	5,728	24,670
Modify Chill Water System	--	2.2	26,791	606,256
Coal Plant	--	1.4	349,160	82,160,000
Hospital Heating Plant Modifications	--	1.4	9,541	433,982
Boiler Economizer (Laundry)	9.0	1.2	2,610	289,000
Manifold Chillers	12.4	0.9	Not Cost-Effective	
Oxygen Compensation	3.2	No Benefits		
Boiler Water Treatment	No Project Required			
Variable Speed Chiller Motor	Not Appropriate			
Insulate Pipes	No Project Required			
Building Shell				
Weatherstripping and Caulking of Mobilization Facilities (In-House)	--	11.3	9,948	78,226
Strip Doors	61.5	6.2	3,582	58,225
Insulation in Various Bldgs.	30.6	5.63	92,596	3,028,889
Infiltration Reduction in Family Housing	--	2.90	60,574	1,723,118
Strip Doors on Warehouses	--	2.4	2,259	47,565
Storm Windows	--	1.03	46,946	2,896,260

TABLE 3. EVALUATED ENERGY CONSERVATION OPPORTUNITIES (Continued)

ECO	E/C	SIR OR B/C*	ENERGY SAVINGS MBTU/YR	COST($)
Building Shell (Continued)				
Patio Storm Doors	13.0	0.9	2,584	187,753
Storm Doors For Family Housing	12.6	0.9	1,612	127,831
Replace Doors	5.6	0.8	Not Cost-Effective	
Vestibules	1.0	0.2	Not Cost-Effective	
Insulating Window Panels	Not Appropriate			
Loading Dock Door Seals	Not Appropriate			
Reduce Solar Heat Gain	Energy Use Increase			
Reduce Door Size	No Project Required			
Loading Dock Curtains	Not Appropriate			
Lighting				
Energy Conserving Fluorescent Lamps	325.7	9.3*	8,938	27,445
Group Re-lamping with Fluorescent Fixtures	--	9.0	64,221	195,173
Exit Lights	--	3.67	9,557	92,320
Replace Existing Area Lighting	21.4	1.7	5,287	247,222
18W and 35W Fluorescent Lamps	84.9	1.6	25.644	302,084
Replace Hangar Lighting	18.5	1.6	12,136	655,930
Replace Incandescent	84.9	1.6	25,644	302,084
Upgrade Incandescent Lights (formerly ECIP's #9, #12, and #20	--	1.3	27,241	735,500
Replace Incandescent with Screw-In Fluorescent	--	1.3	1.1 each**	31 each**

TABLE 3. EVALUATED ENERGY CONSERVATION OPPORTUNITIES (Continued)

ECO	E/C	SIR OR B/C*	ENERGY SAVINGS MBTU/YR	COST($)
Lighting (Continued)				
Use Automatic Dimming Controls	16.2	1.1	848	52,413
Site Lighting	Included with EMCS			
Reduce Height of Luminaires	No Project Required			
Add Switching	No Project Required			
Add Controls to Shut Lamps Off	No Project Required			
Building Heating and Cooling				
Repair/Replace Steam Traps	--	136	92,691	42,200
Calibration of HVAC System Controls	--	19.1	9,429	24,000
Temperature Setback & A/C Shutdown (FM Controls)	112.7	12.62	152,692	1,355,730
Heat Recovery from Air Conditioning Systems	--	6.1	1,837	22,050
Heat Recovery of Refrigeration Equipment at Building 3-1606	--	4.0	629	10,548
Mod. ChW and HVAC System	39.8	3.9*	20,453	513,329
Temperature Setback - FH	17.6	2.6	34,330	1,948,256
Recover Heat (Laundry)	15.6	2.2	1,295	83,160
Install Heat Reclaim Unit for Family Housing	16.91	1.80*	20,744	1,226,666
Free-Cooling Cycle for Building P-2455	--	1.6	642	10,908
Air Stratification	11.0	1.5	220	19,845
Modify Gas Furnaces - FH	12.7	1.3	6,053	476,882

TABLE 3. EVALUATED ENERGY CONSERVATION OPPORTUNITIES (Continued)

ECO	E/C	SIR OR B/C*	ENERGY SAVINGS MBTU/YR	COST($)
Building Heating and Cooling (Continued)				
Replace Gas Pilots w/Spark Ignition	15.4	1.3	1,710	110,989
Auto, Control Valves for Radiators	--	1.1	2,975	218,050
Recirculate Exhaust Air Thru Charcoal	5.8	0.7	Not Cost-Effective	
Heat Pumps	1.4	0.1	Not Cost-Effective	
Shutdown Ventilation Systems	With EMCS			
Warm-up Cycle Controls	With EMCS			
Rezone Heating System	With EMCS			
Economizer Controls	With EMCS			
Control Hot and Cold Deck	With EMCS			
Outside Air Reset Controls	With EMCS			
Flue Dampers	Included with Modify Gas Furnaces Project			
VAV Systems	Included with Other Projects			
Eliminate Uncessary Roof Vents	Not Appropriate			
Reduce Air Flow Rates	Not Appropriate			
Heat Wheels for Recovery	Not Appropriate			
Spot Cooling	Not Appropriate			
Dead-band Thermostats	Not Appropriate			
Attic Ventilation	No Energy Savings			

TABLE 3. EVALUATED ENERGY CONSERVATION OPPORTUNITIES (Continued)

ECO	E/C	SIR OR B/C*	ENERGY SAVINGS MBTU/YR	COST($)
Domestic Hot Water				
Flow Restrictors - BOQ	--	7.8	21,822	189,948
Flow Restrictors - FH	45.9	3.0	14,997	326,872
Desuperheaters	16.9	1.8	20,744	1,226,666
Insulation, Hot Water Tanks	18.4	1.1	4,547	247,740
Use Solar Heating	9.9	0.7	Not Cost-Effective	
Install Power Factor Corrections	52.2	3.9	5,769	110,544
Use Local Hot Water Heaters	No Energy Savings			
Miscellaneous				
Hospital Mods	--	3.04	18,927	300,859
High Efficiency Motors	--	2.4-11.1	5.6-183**	104-747**
Hospital EMCS	--	1.7	46,290	1,139,403
Add to EMCS	--	1.6	173,623	4,158,385
Reduce Number of Elevators in Service	--	1.4	50	991
Use Variable Speed Pumps	No Project Required			
Motor Generator Sets	Not Appropriate			

*This is B/C value

**Project to be performed on a as-needed basis. Post-wide values are not available and therefore, the values shown are not in the totals given in this table.

TABLE 4. ENERGY CONSERVATION INVESTMENT PROGRAM PROJECTS

EEAP INCREMENT	TITLE	COST ($)	SAVINGS (MBtu)	E/C	SIR OR B/C*
B	Install FM controls to provide temp. setback of heating system and A/C shutdown	1,355,730	152,692	112.7	12.62*
B	Heating plant modification	1,236,410	77,948	63.05	10.04*
A	Install flow restrictors in bachelor housing	189,948	21,822	--	7.8
A	Install insulation in various buildings	3,028,889	92,596	30.57	5.63*
A	Mod. ChW and HVAC system	513,329	20,453	39.8	3.9*
B	Mod. electric, distribution system to correct P.F.	110,544	5,769	52.2	3.85*
G	Hospital Mods	300,859	18,927	--	3.04
A	Install flow restrictors in family housing	326,872	14,997	45.88	2.98*
	Infiltration reduction in family housing	1,723,118	60,574	--	2.90
A	Install night setback on heating system in family housing	1,948,256	34,330	17.62	2.55*
B	ChW system modification	606,256	26,791	--	2.2
A	Install heat reclaim unit for family housing	1,226,666	20,744	16.91	1.80*
G	Hospital EMCS	1,139,403	46,290	--	1.7
B	Add to EMCS	4,158,385	173,623	--	1.6
A	Replace light system in hangars and shops	655,930	12,136	18.5	1.55*
E	Coal plant	82,160,000	349,160	--	1.4
G	Hospital heating plant modifications	433,982	9,541	--	1.4

TABLE 4. ENERGY CONSERVATION INVESTMENT PROGRAM PROJECTS (continued)

EEAP INCREMENT	TITLE	COST ($)	SAVINGS (MBtu)	E/C	SIR OR B/C*
A	Upgrade incandescent lights (formerly ECIP's #9, 12, 20)	735,500	27,241	--	1.3
A	Install insulation on DHW tanks	247,740	4,547	18.36	1.08*
A	Install storm windows	2,896,260	46,946	--	1.03
	TOTAL	104,994,077	1,217 MBtu		

*This is B/C value

TABLE 5. OTHER ENERGY CONSERVATION PROJECTS DEVELOPED UNDER THE EEAP ENERGY CONSERVATION PROJECTS

EEAP INCREMENT	TITLE	COST ($)	SAVINGS (MBtu)	E/C	SIR OR B/C*
F	Repair/Replace Steam Traps	42,200	92,691	--	136
F	Calibration of HVAC System Controls	24,000	9,429	--	19.1
F	Weatherstripping and Caulking of Mobilization Facilities (In-House)	78,226	9,948	--	11.3
F	High Efficiency Motors**	104-747**	5.6-183**	--	2.4-11.1
G	Energy conserving floor lamp	27,445	8,938	325.7	9.3*
F	Group Re-lamping with Fluorescent Fixtures	195,173	64,221	--	9.0
D	Refuse incinerator	9,649,910	293,138	30.38	6.82*
G	Strip doors	58,225	3,582	61.5	6.2*
F	Heat Recovery from Air Conditioning Systems	22,050	1,837	--	6.1
F	Repair/Replace Condensate Pumps	24,670	5,728	--	5.6
F	Heat Recovery Off Refrigeration Equipment at Building 3-1606	10,548	629	--	4.0
F	Replace Incandescent Bulbs in Exit Lights	92,320	9,557	--	3.67
F	Strip Doors on Warehouses	47,565	2,259	--	2.4
G	Heat Recovery (laundry)	83,160	1,295	15.6	2.2*
F	Free Cooling Cycle for Building P-2455	10,908	642	--	1.6
G	Replace incandescent lamps	302,084	25,644	84.9	1.6*
G	Air stratification	19,845	220	11.0	1.5*

TABLE 5. OTHER ENERGY CONSERVATION PROJECTS DEVELOPED UNDER THE EEAP ENERGY CONSERVATION PROJECTS (Continued)

EEAP INCREMENT	TITLE	COST ($)	SAVINGS (MBtu)	E/C	SIR OR B/C*
F	Reduce Number of Elevators in Service	991	50	--	1.4
G	Modify gas furnaces in family housing	476,882	6,053	12.7	1.3*
F	Replace Incandescent with Screw-In Fluorescent**	31 each**	1.1 each**	--	1.3
F	Radiator Thermostat Valves	218,050	2,975	--	1.1
	TOTAL	11,384,252	538,836 MBtu		

*This is B/C value

**Project to be performed on a as-needed basis. Post-wide values are not available and therefore, the values shown are not in the totals given in this table.

TABLE 6. PROJECTED ENERGY USE AT FORT BRAGG
AFTER ENERGY CONSERVATION PROJECTS AND NEW CONSTRUCTION

Energy Source	Energy Use (Source)			Estimated FY 1985 Energy Use MBtu/yr	Cost** ($000)
	FY 1983 MBtu/yr	Energy* Projected Savings MBtu/yr	New Construction/ Demolition		
Electricity	2,866,611	74,599	11,586	2,803,598	77,137,296
Natural Gas	1,349,279	3,023	288	1,346,544	8,345,298
#2 Fuel Oil	892,757	12,237	4,001	884,521	7,104,439
#6 Fuel Oil	152,193	110,107	8,326	60,412	244,037
Propane	53,429	--	--	53,429	362,691

*Assumes all Increment F EEAP can be accomplished in FY 1985.
**Assumes an inflation rate of 4 percent per year over FY 1983 prices.

TABLE 7. SUMMARY OF TYPICAL BUILDING CONSTRUCTION CHARACTERISTICS*

CATEGORY CODE	BLDG. NO.	BUILDING DESCRIPTION	NO. OF FLOORS	CONSTRUCTION TYPE - U VALUES										BUILDING AREA (FT^2)	WINDOW AREA (FT^2)	WINDOW/ BUILDING
				ROOF TYPE [1]	U VALUE	WALL TYPE	U VALUE	DOOR TYPE	U VALUE	FLOOR TYPE	U VALUE	WINDOW TYPE	U VALUE			
C_{FH}	1-5419	FH COL.	2	P, CLAY TILE	0.06	STUCCO	0.37	WOOD W/STORM	0.33	CONCR	0.10	DOUBLE PANE	0.50	4,747	574	0.12
C_B, A	2-1120	EM BKS, ADMIN.	3	P, ASP SH.	0.15/ 0.18	BRICK CONCR	0.10	WOOD	0.45	CONCR	0.19 0.10	SINGLE PANE & STORM WINDOWS	0.56	76,440	4,939	0.07
E	2-2402	QM REPAIR SHOP	1	P, ASP. SH.	0.37/ 0.08	BRICK	0.41	WOOD, METAL	0.73	CONCR	0.10	SINGLE & DBL PANE	0.93	7,066	949	0.13
C_{FH}	2-2442	FH NCO	1	P, CLAY TILE	0.06	STUCCO	0.37	WOOD w/STORM	0.33	CONCR	0.10	DOUBLE PANE	0.50	2,034	210	0.10
F	2-5713	FIXED LAUNDRY	1	F, WOOD, CONCR	0.25	WOOD, CMU	0.32/ 0.39	WOOD, METAL	0.45/ 0.59	CONCR	0.10	SINGLE PANE	1.10	59,717	1,851	0.04
F	3-1602	PHYS. FIT. CTR	1	F, CONCR	0.19	BRICK, CMU	0.26	GLASS, WOOD	0.82	CONCR	0.10	SINGLE PANE	1.10	36,582	3,748	0.10
E	3-1933	FE MNT SHOP	1	P, METAL	0.92	8" CMU	0.39	METAL, MET/ GLASS	1.11	CONCR	0.10	SINGLE PANE	1.10	7,000	144	0.02
F	4-1432	YOUTH CENTER	1	F, BLT-UP	0.09	BRICK, CMU	0.16	GLASS, METAL	0.82	CONCR	0.10	SINGLE PANE/ SKYLIGHT	0.90	17,956	731	0.04
C_{FH}	6-8125	FH AC Wh NCO	2	P, ASP. SH.	0.06	BRICK	0.20	WOOD w/STORM	0.30	CONCR	0.10	DOUBLE PANE	0.50	5,717	750	0.13
F	8-5476	COMMISSARY	1	F, BLT-UP	0.14	BRICK, CMU	0.22	METAL, GLASS	0.89	CONCR	0.10	METAL LOUVERS	1.18	89,604	0	0.00
D	8-6603	GEN PURP WHSE	1	P, METAL	0.55	CORREGATED MET	0.33	WOOD	0.45	WOOD JOIST	0.40	SINGLE PANE	1.10	9,373	68	0.01
C_{FH}	9-2640	FH NCO	1	P, ASP. SH.	0.05	AL SIDING	0.10	WOOD w/STORM, GLASS	0.45	CONCR	0.10	SINGLE PANE	1.10	2,108	187	0.09
A	9-5830	GEN INST BLDG	1	P, METAL	0.26	METAL	0.20	METAL/GLASS	0.59	CONCR	0.10	SINGLE PANE	1.10	1,200	120	0.10
E	A-2058	MOTOR REP. SHOP	1	P, ASP. SH	0.53	WOOD SIDING	0.24	METAL/WOOD	0.45	CONCR	0.10	SINGLE PANE	1.10	2,240	240	0.11
B	A-4686	ENL. PERS. MESS	1	P, ASP. SH.	0.49	WOOD SIDING	0.26	WOOD	0.45	WOOD JOIST	0.48	SINGLE PANE	1.10	2,253	324	0.14
C_B	A-5085	EM BKS W/O MESS	2	P, ASP. SH.	0.27	WOOD SIDING	0.27	WOOD	0.45	WOOD JOIST	0.48	SINGLE PANE	1.10	4,720	610	0.13
A	A-5086	ADM GEN PURP	2	P, ASH. SH	0.27	WOOD SIDING	0.27	WOOD	0.45	WOOD JOIST	0.48	SINGLE PANE	1.10	4,720	610	0.13
C_{FH}	B-6166	FH CAPE CC & WD	1	P, ASH. SH	0.06	BRICK	0.20	WOOD w/STORM	0.30	CONCR	0.10	DOUBLE PANE	0.50	3,007	416	0.14
D	C-2222	GEN PURP WHSE	1	F, BLT-UP	0.16	CMU	0.39	METAL	1.15	CONCR	0.10	SINGLE PANE	1.10	66,229	1,778	0.03

[1] P - PITCHED
F FLAT

CMU - CONCRETE MASONARY UNIT
ASP. SH. - ASPHALT SHINGLES
MET - METAL
BLT-UP - BUILT UP
CONCR - CONCRETE
AL. SIDING - ALUMINUM SIDING

*Information taken from Building Survey forms and Fort Bragg Building Information Schedule RCS:EN6 $126R_3$

TABLE 7. SUMMARY OF TYPICAL BUILDING CONSTRUCTION CHARACTERISTICS* (continued)

CATEGORY CODE	BLDG. NO.	BUILDING DESCRIPTION	NO. OF FLOORS	CONSTRUCTION TYPE - U VALUES										BUILDING AREA (FT^2)	WINDOW AREA (FT^2)	WINDOW/ BUILDING
				ROOF TYPE	U VALUE	WALL TYPE	U VALUE	DOOR TYPE	U VALUE	FLOOR TYPE	U VALUE	WINDOW TYPE	U VALUE			
A	C-4127	BN HQ BLDG	1	F, BLT-UP	0.04	CMU	0.39	WOOD	0.45	CONCR	0.10	SINGLE PANE	1.10	2,578	391	0.15
B, C_B	C-4426	EM BKS W/MESS	3	F, BLT-UP	0.05/ 0.14	CMU, CONCR	0.34	METAL	0.59	CONCR	0.10	SGL & DBL PANE	1.10/ 0.50	39,550	6,478	0.16
A	C-5635	RQT BDE HQ	2	F, BLT-UP	0.04	CMU, CONCR	0.33	GLASS/WOOD	0.64	CONCR	0.10	SINGLE PANE	1.10	9,200	1,882	0.20
E	C-6018	MOTOR REP SHOP	1	F, BLT-UP	0.25	CMU, CONCR	0.31	WOOD	0.45	CONCR	0.10	SINGLE PANE	1.10	4,787	914	0.19
C_B	D-2617	EM BKS W/O MESS	3	F, BLT-UP	0.10	BRICK, CMU	0.30	GLASS, META	0.93	CONCR	0.10	SINGLE PANE	1.10	41,520	5,844	0.14
B	D-2626	ENL PERS MESS	1	F, BLT-UP	0.05	BRICK, CMU	0.29	METAL	0.59	CONCR	0.10	SINGLE PANE	1.10	13,274	1,273	0.10
A	D-2815	ADM & SUP BLDG	1	F, BLT-UP	0.19	BRICK, CMU	0.27	METAL	0.59	CONCR	0.10	SINGLE PANE	1.10	12,135	1,108	0.09
A	D-3004	SP WF & ACAD BLDG	1	F, BLT-UP	0.14	CONCR, STUCCO	0.17	GLASS, METAL	1.06	CONCR	0.10	SINGLE PANE	1.10	72,586	5,574	0.08
A	D-3206	ADM GEN PURP	6	F, CONCR	0.11	CONCR, CMU	0.20	GLASS	1.10	CONCR	0.10	SINGLE PANE	1.10	84,254	15,792	0.19
C_B	D-3705	BOQ MIL MALE	6	F, CONCR	0.11	BRICK	0.24	GLASS, METAL	0.92	CONCR	0.10	SINGLE PANE	1.10	121,290	12,406	0.16
C_{FH}	G-2213	FH CG & WO	2	P, ASP, SH.	0.05	BRICK, WOOD	0.08	GLASS, WOOD	0.88	CONCR	0.10	SINGLE PANE	1.10	6,855	360	0.05
C_{FH}	G-3124	FH LC & MJ	2	P, ASP, SH	0.05	BRICK, WOOD	0.08	GLASS, WOOD	0.94	CONCR	0.10	SINGLE PANE	1.10	4,460	322	0.07
E	H-3057	TAC EQUIP SHOP	2	F, METAL	0.21	CMU	0.28	METAL	0.75	CONCR	0.10	SINGLE PANE	1.10	28,880	437	0.02
C_B	H-4654	EM BKS W/O MESS	3	F, CONCR	0.04	BRICK	0.09	GLASS, METAL	0.74	CONCR	0.10	SINGLE PANE	1.10	3,067	1,262	0.04
B	H-4842	ENL PERS MESS	1	F, BLT-UP	0.05	BRICK	0.15	GLASS, META	0.91	CONCR	0.10	DOUBLE PANE	0.50	16,289	1,970	0.12
E	J-1303	AR DEL EQP MNT	1	P, ASP. SH.	0.42	WOOD SIDING	0.32	WOOD	0.43	CONCR	0.10	SINGLE PANE	1.10	49,424	9,186	0.19
D	J-2050	GEN PURP WHSE	1	F, CONCR	0.09	CMU	0.39	METAL	1.13	CONCR	0.10	SINGLE PANE	1.10	80,754	2,460	0.03
D	J-2535	GEN PURP WHSE	1	F, METAL	0.12	METAL	0.21	METAL	0.21	CONCR	0.10	SINGLE PANE	1.10	160,000	1,232	0.08
B	M-3751	ENL PERS MESS	1	P, ASP, SU	0.06	WOOD SIDING	0.09	WOOD	0.45	WOOD JOIST	0.08	SINGLE W/STORM	0.50	2,892	396	0.14

*Information taken from Building Survey forms and Fort Bragg Building Information Schedule RCS:ENG $126R_3$

TABLE 7. SUMMARY OF TYPICAL BUILDING CONSTRUCTION CHARACTERISTICS* (continued)

CATEGORY CODE	BLDG. NO.	BUILDING DESCRIPTION	NO. OF FLOORS	CONSTRUCTION TYPE - U VALUES										BUILDING AREA (FT^2)	WINDOW AREA (FT^2)	WINDOW/ BUILDING
				ROOF TYPE	U VALUE	WALL TYPE	U VALUE	DOOR TYPE	U VALUE	FLOOR TYPE	U VALUE	WINDOW TYPE	U VALUE			
Δ	M-3753	ADM GEN PURP	1	P, ASP, SH.	0.09	WOOD SIDING	0.09	WOOD	0.45	WOOD JOIST	0.08	SINGLE W/STORM	0.50	2,892	396	0.14
E	P-3262	MNT AC AG ORG	2	F BLT-UP	0.13	METAL, CMU	0.28	METAL	1.09	CONCR	0.10	SINGLE & DOUBLE	1.01	63,651	1,070	0.02
E	P-3637	MNT AC AG ORG	2	F BLT-UP	0.21	CMU, METAL	0.20	METAL, WOOD	0.70	CONCR	0.10	SINGLE PANE	1.10	21,151	1,210	0.06

*Information taken from Building Survey Forms and Fort Bragg Building Information Schedule RCS:ENG 126R3

TABLE 8. SUMMARY OF TYPICAL BUILDING ENERGY USE

Category Code	BLDG. NO.	HEATING		DOMESTIC HOT WATER		COOLING		LIGHTING		FANS		PROCESS	
		PEAK (Btuh)	ANNUAL (10^6 Btu/Yr)	PEAK (Btuh)	ANNUAL (10^6 Btu/Yr)	PEAK (Btuh)	ANNUAL (kWh/Yr)	PEAK (kW)	ANNUAL (kWh/Yr)	PEAK (kW)	ANNUAL (kWh/Yr)	PEAK (kW)	ANNUAL (kWh/Yr)
C_{FH}	1-5419	81,139	137	18,700	18	None	--	2.27	2,943	0.6	1,000	4.5	3,308
C_B A	2-1120	Office 1,016,000	1,904	120,700	45.1	2,067,969	313,040	68.7	178,620	14.5	26,409	58.4	145,902
		Barracks 254,000	476	225,200	215.3	516,992	78,260	21.2	76,062	4.3	16,625	4.9	9,300
E	2-2402	325,958	552	5,630	1.7	150,122	22,750	6.5	14,040	1.8	5,520	5.9	14,839
C_{FH}	2-2442	30,931	52	18,700	18	None	--	2.27	1,261	0.6	1,000	4.5	3,308
F	2-5713	2,201,566	3,729	11,102	14	None	--	45.5	106,470	40.3	86,490	406	405,696
F	3-1602	1,506,512	2,552	377,800	369.9	None	--	23.1	126,126	5.8	18,789	39	89,626
E	3-1933	593,767	1,006	61,400	18.4	None	--	4.2	9,828	2.1	8,172	16.3	35,588
F	4-1432	522,964	886	253,300	91.2	913,028	137,487	29.4	112,892	12.3	32,354	17.6	43,992
C_{FH}	6-8125	118,325	200	74,800	72	120,000	21,190	2.27	3,544	0.6	6,000	18	13,232
F	8-5476	1,414,380	2,395	186,500	392.6	1,225,811	184,314	197.5	1,730,100	80.6	611,847	829	1,814,429
D	8-6603	39,544	67	None	--	None	--	3.4	8,840	0.1	580	Negl.	--
C_{FH}	9-2640	37,869	64	37,400	36	60,000	10,595	2.27	1,307	0.6	3,000	10	7,342
A	9-5830	41,437	70	*113,900	*85.4	None	--	1.7	5,746	0.3	1,001	1.2	2,140
E	A-2058	151,891	257	None	--	None	--	2.9	7,540	0.3	1,006	3.1	7,211
B	A-4686	159,852	271	142,600	285.2	None	--	2.2	9,152	1.2	4,008	1.0	8,787
C_B	A-5085	234,982	398	54,000	51.7	None	--	5.6	12,230	1.4	5,058	1.2	2,232
A	A-5086	234,982	398	7,000	2.6	None	--	3.6	8,112	0.6	1,236	4.6	11,564
C_{FH}	B-6166	53,237	90	37,400	36	None	--	2.27	1,864	0.6	2,000	9	6,616
D	C-2222	2,100,000	3,494	None	--	None	--	76.8	199,680	2.4	6,380	Negl.	--
A	C-4127	85,781	57	49,200	36.5	None	--	2.7	14,597	0.6	2,149	2.5	6,316

*Central latrine serving 52 buildings.

TABLE 8. SUMMARY OF TYPICAL BUILDING ENERGY USE (continued)

Category Code	BLDG. NO.	HEATING		DOMESTIC HOT WATER		COOLING		LIGHTING		FANS		PROCESS	
		PEAK (Btu/h)	ANNUAL (10^6 Btu/Yr)	PEAK (Btu/h)	ANNUAL (10^6 Btu/Yr)	PEAK (Btu/h)	ANNUAL (kWh/Yr)	PEAK (kW)	ANNUAL (kWh/Yr)	PEAK (kW)	ANNUAL (kWh/Yr)	PEAK (kW)	ANNUAL (kWh/Yr)
B, C_B	C-4426	Dining 204,505	346	142,600	37.1	323,055	***	12.1	44,722	6.0	26,856	118.2	106,816
		Barracks 653,198	1,110	243,200	232.6	1,383,700	****	31.2	173,006	14.5	47,955	5.3	10,044
A	C-5635	274,377	514	14,300	5.3	None	--	14.1	39.260	3.2	20,912	9.0	22,540
E	C-6018	311,887	528	38,600	11.6	None	--	7.1	14,768	1.6	2,115	20.7	43,473
C_B	D-2617	813,794	1,378	538,200	514.7	1,537,441	164,736	21.3	112,090	6.4	22,412	11.7	22,227
B	D-2626	1,061,658	1,798	210,200	403.5	564,340	60,525	17.0	83,776	10.6	44,370	5.9	51,769
A	D-2815	359,930	610	None	--	459,816	48,906	15.3	39,780	3.8	4,730	11.9	29,731
A	D-3004	1,550,000	3,199	326,500	121.8	4,850,000	519,948	125.5	326,300	38.0	197,212	71.1	177,836
A	D-3206	2,031,601	3,441	98,200	36.6	4,590,000	491,907	124.2	355,212	74.3	190,118	82.6	206,422
C_B	D-3705	2,102,364	3,561	3,295,900	801.6	3,701,837	396,396	64.2	217,674	69.1	214,885	15.2	28,923
C_{FH}	G-2213	86,502	147	74,800	72	120,000	21,190	2.27	4,250	0.6	6,000	20	14,684
C_{FH}	G-3124	65,134	110	37,400	36	60,000	10,595	2.27	2,765	0.6	3,000	10	7,342
E	H-3057	1,956,236	3,313	263,200	78.9	304,293	45,500	76.7	271,305	22.0	50,715	30.3	73,181
C_B	H-4654	516,755	875	620,500	593.4	875,201	*	30.1	57,366	16.7	61,002	11.9	22.506
B	H-4842	1,810,000	3,067	157,600	429.6	1,020,433	**	44.7	120,942	30.7	125,587	7.2	63,527
E	J-1303	2,759,881	4,674	215,700	64.7	None	--	58.6	152,360	5.1	15,937	44.5	110,753
D	J-2050	2,700,000	4,573	None	--	None	--	91.5	237,900	0.7	1,985	Negl.	--
D	J-2535	4,327,960	733	Negl.	--	None	--	169.8	441,480	1.4	3,970	Negl.	--
B	M-3751	60,623	103	123,600	225.9	None	--	3.6	13,306	1.2	4,419	1.3	11,279
A	M-3753	60,623	103	None	--	None	--	3.6	8,424	0.2	551	2.8	7,085
E	P-3262	2,977,914	5,044	301,600	90.5	995,236	151,060	139.4	430,716	14.0	47,265	54.9	137,845
E	P-3637	835,385	1,415	54,000	27	None	--	40.1	114,686	3.0	8,863	17.6	44,417

* Doesn't use electricity 1.8×10^9 Btu per year (HTW)
** Doesn't use electricity 2.1×10^9 Btu per year (HTW)
***Doesn't use electricity 0.5×10^9 Btu per year (steam)
****Doesn't use electricity 2.2×10^9 Btu per year (steam)

6. RESULTS OF INCREMENT B - DISTRIBUTION SYSTEMS, EMCS

The scope of Increment B involved an engineering analysis of the Post's utilities, energy distribution systems, the existing plants, and the potential for an EMCS. Load profiles for each energy source were performed. The annual energy use profile for fossil fuel and electricity is presented in Figure 5 and 6 respectively. As shown in Table 9, the existing energy plants were evaluated for efficiency. A evaluation was performed for connecting other buildings at Fort Bragg to the current EMCS. The use of an FM control energy management system was also analyzed. As the result of these evaluations, five ECIP projects were recommended. These are listed in Table 4.

7. RESULTS OF INCREMENT C - USE OF BIOMASS

The Increment C study at Fort Bragg was limited to evaluating the use of on-Post or nearby biomass (timber products) as a fuel source. An assessment of biomass availability and cost-effectiveness was performed. This showed that the cost of coal was lower than wood for an equal amount of energy, using a value of $16 per ton of green wood chip. It was recommended that future energy conversions first consider coal as the fuel.

8. RESULTS OF INCREMENT D - SOLID WASTE

The Increment D study at Fort Bragg was limited to evaluating the collection and burning of refuse generated on Post as opposed to using current fuel and waste management. A life cycle cost analysis was performed to determine the cost-effectiveness of burning Fort Bragg's refuse. The Post generates approximately 93 tons of solid waste per day which has an energy potential of 55 MBtu per hour. The evaluation showed that using five 25-ton per day incinerators was the most cost effective and an ECIP project was prepared for this system.

9. RESULTS OF INCREMENT E - CENTRAL BOILER PLANTS

The Increment E scope of work required the evaluation of utilizing large central boiler plants in lieu of smaller, individual, building heating plants. Central plants for servicing discrete parts of the Post were considered. As stated in the scope of work, coal is the preferred fuel. Life cycle cost

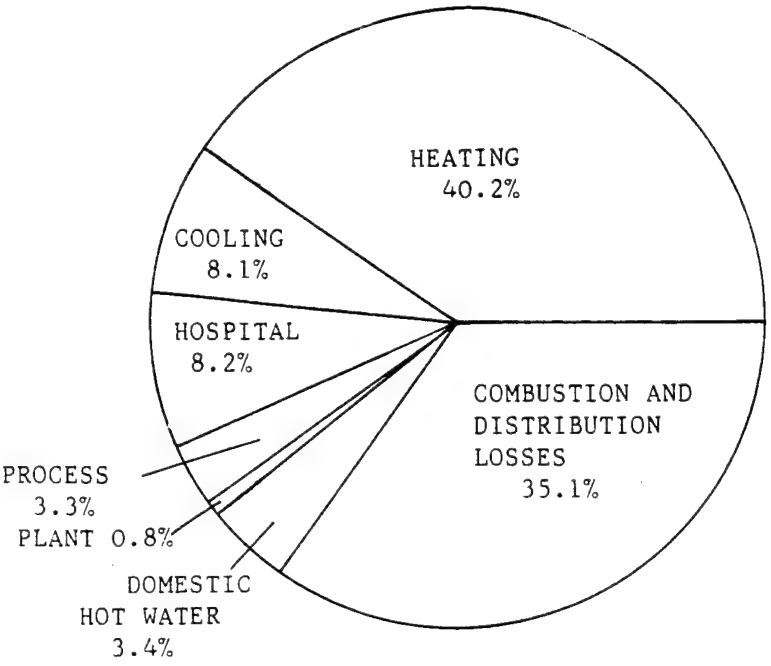

FIGURE 5. FOSSIL FUEL ENERGY USE

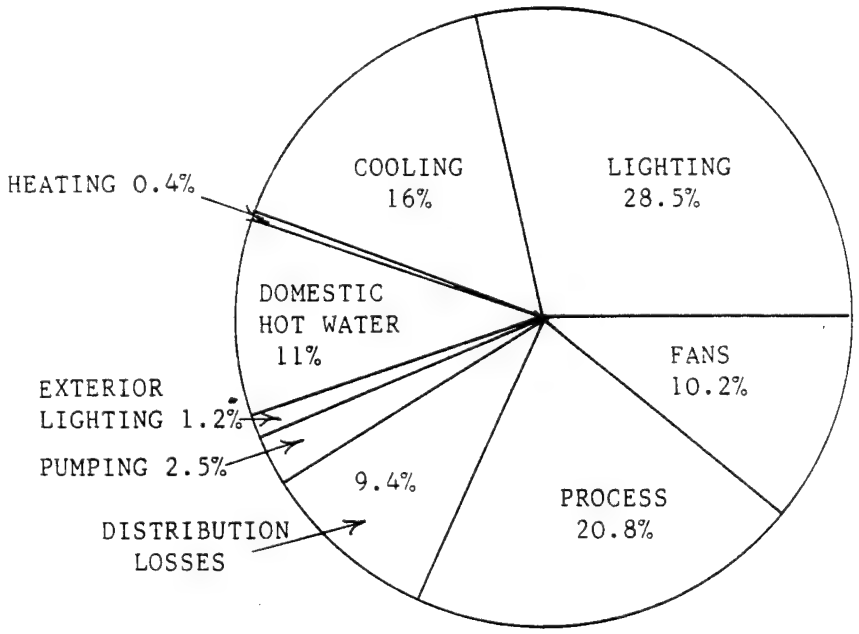

FIGURE 6. ELECTRICAL ENERGY USE

TABLE 9. MAJOR HEATING PLANTS PROFILE, FY 1979[1]*

PLANT	FOSSIL FUEL USE[2] TYPE-QUANTITY	FOSSIL FUEL USE[2] ENERGY CONTENT	PLANT[3] LOSSES	PLANT CONVERSION[4] EFFICIENCY	GROSS PLANT[5] OUTPUT	PLANT[6] USES	NET PLANT[7] OUTPUT	DISTRIBUTION[8] LOSSES	DISTRIBUTION[9] EFFICIENCY	USEFUL ENERGY[10] DELIVERED	OVERALL[11] EFFICIENCY
C-1432	#6 Oil -3,406,929 NAG 168,445 Waste Oil- 94,143	697,742	188,261	73.0%	509,481	13,786	495,695	211,700	57.3%	283,995	40.7%
D-3529	#6 Oil -1,548,673 NAG - 70,429	304,433	53,616	82.4%	250,817	4,490	246,327	40,101	83.7%	206,226	67.7%
4-3124	#6 Oil -1,006,621 NAG - 47,220	199,366	159,810	70%	139,556	2,500	137,056	41,117	70%	95,939	48.1%
				Energy balance to be included in EEA Hospital Study							
2-5411	#6 Oil - 262,368 #2 Oil - 8,152 NAG - 17,710	58,663	16,930	71.1%	41,733	908	40,825	Negligible	Negligible	40,825	69.6%
TOTAL	#6 Oil -6,224,591 NAG - 303,804 #2 Oil - 8,152 Waste Oil- 94,143	1,260,204	258,807	—	802,031	19,184	782,847	251,801	—	531,046	—

1. Values are based on plant heat balance, except the hospital which was based on estimated efficiencies. See Appendix H for supportive calculations. Units are millions of Btu except as noted.
2. Source - Boiler Logs. Fuel oil quantities are shown in gallons, natural gas (NAG) in thousand's of cubic feet (KCF). Energy Contents: #6 and Waste Oil - 149,690 Btu/gal; NAG - 1,031,000 Btu/KCF; #2 Oil - 138,690 Btu/gal.
3. PLANT LOSSES include all heat losses that occur at the plant. Major loss is in stack gas.
4. PLANT CONVERSION EFFICIENCY = GROSS PLANT OUTPUT ÷ FUEL ENERGY CONTENT
5. GROSS PLANT OUTPUT = FOSSIL FUEL ENERGY CONTENT - PLANT LOSSES
6. PLANT USES include energy used for 1) oil preheating, 2) oil atomization, and 3) operating steam turbine mechanical drives.
7. NET PLANT OUTPUT = GROSS PLANT OUTPUT - PLANT USES
8. DISTRIBUTION LOSSES include all energy losses incurred throughout the piping networks served by the respective plants.
9. DISTRIBUTION EFFICIENCY = USEFUL ENERGY DELIVERED ÷ NET PLANT OUTPUT
10. USEFUL ENERGY DELIVERED = NET PLANT OUTPUT - DISTRIBUTION LOSSES
11. OVERALL EFFICIENCY = USEFUL ENERGY DELIVERED ÷ FOSSIL FUEL ENERGY CONTENT

*From Increment B and G Report

analyses were performed on various alternatives. A central plant capable of providing high temperature hot water (HTHW) heating energy for the A, C, D, H, M, 1, 2, 3, and 4 areas at Fort Bragg was determined to be most cost-effective. A 1391 and PDB were prepared for the construction of the recommended plant.

10. RESULTS OF INCREMENT F - FACILITY ENGINEER CONSERVATION MEASURES

The scope of work to be performed under Increment F is the identification of energy conservation opportunities that are within the Facilities Engineer funding authority, or which satisfy QRIP, OSD PIF, or PECIP requirements. In the performance of the Increment F evaluation, almost 30 buildings on Post were evaluated and eight infiltration tests were performed.

Another element of the Increment F report is to identify the energy conservation measures accomplished by the Post since 1975. Table 10 lists these projects. Also to be addressed are the planned facility changes and their impact on energy use. These are shown in Table 11. The recommended Increment F projects are presented in Table 12.

11. RESULTS OF INCREMENT G - MAINTENANCE, REPAIR, AND MINOR PROJECTS FOR ENERGY CONSERVATION

The scope of work for Increment G is the identification of cost-effective energy saving projects which do not qualify under ECIP criteria. The Increment G work was performed in conjunction with Increments A and B. The recommended projects are listed in Table 5. A listing of projects accomplished by the Post since 1975 can be found in Table 10.

12. RESULTS OF HOSPITAL ENERGY AUDIT

The scope of work called for a detailed audit of the hospital and energy support facilities, a utility meter plan development, and the investigation of over 70 energy conservation measures. Emphasis was placed on each Energy Management and Control System (EMCS) for the hospital. The analysis was

TABLE 10. POST ENERGY PROJECTS BY BUILDING CATEGORY*

Energy Conservation Retrofit	Offices	Dining	Family Housing	Barracks	Ware-house	Shops	Service	Date
Wall & Ceiling Insulation	•	•	•	•			•	
Reduce Window Opening	•			•				
Storm Windows	•	•	•	•			•	
Storm Doors			•					
EMCS (Honeywell 1000)	•						•	
Night Setback	•				•	•	•	
Solar Screen	•			•				
Solar DHW		•		•				
Peak Load Shedding (Motorola)			•					

*Reference: See Ft. Bragg EEAP Increment A Final Report for definition

TABLE 11. PLANNED FACILITY CHANGES

CONSTRUCTION ACTIVITY	BUILDING CATEGORY	TOTAL SQ.FT. FY 1981 - 1983	TOTAL ENERGY USE PER SQ.FT. BTU/YR	TOTAL ENERGY USE IN EACH CATEGORY MBTU/YR
New Construction	Offices	209,181	108,666	22,731
	Dining	18,423	333,869	6,151
	Bachelor Housing	322,844	111,199	35,900
	Family Housing	36,260	76,134	2,761
	Shops	38,946	107,819	4,199
	Warehouse	182,200	129,856	23,660
	Services	70,725	158,474	11,208
	TOTAL ENERGY USE			106,610

CONSTRUCTION ACTIVITY	BUILDING CATEGORY	TOTAL SQ. FT.	TOTAL ENERGY USE MBTU/YR
Demolition	Offices	11,883	1,214.7
	Dining	3,887	470.7
	Bachelor Housing	15,340	1,328.0
	Family Housing	None	None
	Shops	None	None
	Warehouse	36,240	2,771.5
	Services	23,450	3,066.2
	TOTAL	90,800 sf	8,851.1 MBtu/yr

TABLE 12. INCREMENT F PROJECTS

Energy Option	Funding Program	Project Cost ($)	Energy Saved (MBtu)	Annual Cost Savings ($)	SIR
Repair/Replace Steam Traps	QRIP/O&M	42,200	92,691	400,010	136
Calibration of HVAC System Controls	QRIP/O&M	24,000	9,429	42,433	19.1
Re-lamping with Energy Efficient Fluorescent at Burnout	OSD PIF	195,173	64,221	163,500	9.0
Weatherstripping and Caulking of Mobilization Facilities (In-House)	OSD PIF	78,226	9,948	59,216	11.3
High Efficiency Motors**	O&M	104-747*	5.6-183*	22-725*	2.4-11.1
Heat Recovery from Air Conditioning Systems	QRIP	22,050	1,837	11,417	6.1
Repair/Replace Condensate Pumps	QRIP/O&M	24,670	5,728	1,020	5.6
Heat Recovery Off Refrigeration Equipment at Building 3-1606	PECIP	10,548	629	2,926	4.0
Replace Incandescent Bulbs in Exit Lights	QRIP	92,320	9,557	85,044	3.67
Strip Doors on Warehouses	O&M	47,565	2,259	6,930	2.4
Free Cooling Cycle for Building P-2455	O&M	10,908	642	1,495	1.6

TABLE 12. INCREMENT F PROJECTS (Continued)

Energy Option	Funding Program	Project Cost ($)	Energy Saved (MBtu)	Annual Cost Savings ($)	SIR
Reduce Number of Elevators in Service	O&M	991	50	117	1.4
Replace Incandescent with** Screw-In Fluorescent	O&M	31 each	1.1 each	10 each	1.3
Radiator Thermostat Valves	O&M	218,050	2,975	19,916	1.1
TOTAL		776,701	199,966	794,024	

*Replacement at time of failure/burnout
**Projects with one for one replacement calculations are not included in total cost/savings for Increment F

performed with the assistance of the Building Loads and System Thermodynamics (BLAST) computer program developed by the Army Construction Engineering Research Lab (CERL). ECIP documents were developed for recommended measures. The major energy-related projects in Womack Hospital accomplished by the installation since 1975 are as follows:

- Turn off stairway heaters;
- Use energy efficient fluorescent lamps;
- Install new double-pane windows; and
- Use emergency generator to shave electric peak.

A listing of the recommended ECIP projects from this evaluation is presented in Table 4. Other recommended energy conservation projects are listed in Table 13. The projected result of implementing the recommended energy conservation projects is a reduction of hospital energy use by approximately 35 percent. The total energy savings identified was 67 billion Btu per year, representing an annual cost savings of more than $280,000.

13. ENERGY PLAN

A summary of the impact of JRB-recommended energy conservation projects and future Post actions on annual energy use is presented in Table 14. The estimated annual energy use increase comparing FY 1975 values to FY 1985 is one percent. Table 6 shows FY 1985 projected energy use and cost.

A comparison of annual energy use per square foot of Fort Bragg floor area is shown in Table 15. The projected percent change from FY 1975 to FY 1985 is a one percent decrease.

14. RESULTS AND RECOMMENDATIONS

The quantity of energy use at Fort Bragg will continue to increase as long as the current increases in conditioned building space continue. These trends can be reversed by accomplishing several major actions. They are:

- Maintain the current energy conservation program at the Post level;
- Continue to program and fund major energy conservation projects;

TABLE 13. WOMACK HOSPITAL OPERATION AND MAINTENANCE (O&M) AND QUICK RETURN ON INVESTMENT PROJECTS (QRIP)

Project Classification	Description	Project Costs*** Initial $	Initial Man Hrs	Annual $	Annual Man Hrs	Const. Time	Annual Savings Raw Source MBTU Elec.	Nat. Gas	Energy Savings*** $/yr	Man Hours	SIR
QRIP	Repair of Steam Line Insulation	8600	70	N/A	N/A	2 wks	--	3600	16,800	N/A	28
	Reduction of Air Quantities	16300	520	N/A	N/A	13 wks	1450	750	12,725	N/A	10
O&M	Steam Trap Repair	N/A	N/A	$2030 plus $100-300/ trap	64 plus 1 hr/ trap	N/A	--	460/trap	2150/trap	(increase*)	1 to 8
	High Efficiency Motors	500-2900/ motor	2/ motor	N/A	N/A	N/A	1160**	--	8900**	N/A	1 to 5
	Weatherstripping	6800	100	N/A	N/A	3 wks	35	80	120	N/A	1
	Electronic Ballasts	32/ Ballast	.5/ Ballast	N/A	N/A	N/A	5900**	--	21,500**	N/A	1
	Revised Cleaning and Light Sched.	N/A	N/A	N/A	N/A	N/A	1825	--	5000	N/A	N/A
	Revised Site Lighting	N/A	N/A	N/A	N/A	N/A	230	--	900	N/A	N/A

*See Project Costs
**These are recommended replacements at time of failure. This total savings will not be realized until all items are replaced.
***1983 dollars

Analysis Date - October, 1983

TABLE 14. PROJECTED ENERGY USE FOR FY 1985 (Btu x 10^9)

FY	1975	1979	1982	1983	PERCENT INCREASE FROM 1975 (OVER 1983)	PROJECTED USE 1985	% INCREASE FROM 1975
Energy Use 10^9 Btu/yr	5,294.9*	5,030.9	5,367	5,314.3*	.4	5,338.0	1.0
Sq.Ft. (x 10^3)	20,528	22,101	22,745	23,030	12	23,345.8	14

TABLE 15. FY 1985 ENERGY USE

FISCAL YEAR	TOTAL BLDG. SQ. FT.	% CHANGE OVER BASELINE	ENERGY USE Btu x 10^6 PER YR.	% CHANGE OVER BASELINE	ENERGY USE Btu/SQFT/YR	% CHANGE OVER BASELINE
1975 (Baseline)	20,528,000	---	5,294,900	---	257,810	---
1979 (Actual)	22,101,000	7.6	5,030,900	(5)	227,632	(11.7)
1985 (Projected)	23,345,800	13.7	5,338,470	.8	228,669	(11)

NOTE: ( ) denotes a decrease

- Pursue a central energy plant at Fort Bragg, either through third party financing or by Military Construction Program funds; and

- Place additional emphasis on using EMCS in energy conservation work. This will involve continual operator training and energy system control maintenance, but will produce energy savings if given the proper emphasis.